DUPLICATE

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FOREIGN WOODS

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MANBARKLAK
Eschweilera longipes (Poit.) Miers
Eschweilera subglandulosa (Steud.) Miers
Family: Lecythidaceae

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DEPOSITORY

Distribution and Habitat

The genus Eschweilera includes about 80 species distributed from eastern Brazil through the Amazon basin to Trinidad and Costa Rica. Surinam is the chief source of manbarklak, obtained from at least two species, Eschweilera longipes (Poit.) Miers and E. subglandulosa (Steud.) Miers. Fifteen or more species of Eschweilera occur in British Guiana and are called kakeralli without distinction as to kind, but at least 75 percent of the kakeralli trees are the more valuable black kakeralli, Eschweilera sagotiana Miers. The black kakeralli of British Guiana closely resembles the manbarklak of Surinam (3, 5, 16).[2]

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[1] Maintained at Madison, Wis., in cooperation with the University of Wisconsin.

[2] Underlined numbers in parentheses refer to the list of numbered references at the end of the article.

Other Common Names

Manbarklak is also known by the following names (13, 14, 16):

Akakarie	Mekoekoeware
Atotoito	Tamoenin kwatere
Baäkalaka	Tapirin kwatere
Barklak	Tapoeloe kwatelie
Barkraki	Tekarajan kwatere
Black Karalli	Toledo Wood
Kakaralli wadilikoro	Topoeroe kwatere
Kwaterie	Wadilie kakaralie
Kwattere	Wadodorie
Manbarkraki	Wadoedoeli

The Tree

Manbarklak trees vary in size from small to fairly large. Some specimens may reach a height of 100 feet. The bole is usually straight and cylindrical. The butt, however, may be somewhat fluted and buttressed. The bark is dark gray.

The flowers of Eschweilera longipes are large, reddish or violet, and form clusters at the ends or sides of the branches; those of E. subglandulosa are smaller, white or cream colored, and fragrant (14).

The Wood

Color

The heartwood is gray or olive brown to red brown, somewhat streaked, and rather sharply demarcated from the yellowish sapwood (9, 16).

Luster

The luster is rather low.

Texture and Grain

Manbarklak has a uniform and rather fine texture and is typically straight grained (16).

Weight

In the manbarklak group, the specific gravity (air dry) as reported, ranges from 1.10 to 1.25, and the weight from 69 to 78 pounds per cubic foot (16). The specific gravity (weight and volume at 15 percent moisture content) of manbarklak tested at the Institute for Physical Research at Delft, The Netherlands, was 1.00 to 1.10.[3]

Mechanical Properties

The wood is hard, compact, tough, and strong (16). Although average strength values for manbarklak are not available, the mechanical properties for another species, black kakeralli (E. sagotiana) from British Guiana, have been determined at Yale (19) and are presented in table 1.

Seasoning and Shrinkage

Shrinkage data for manbarklak are not available, but results of tests on the similar wood, black kakeralli (E. sagotiana) are presented in table 2. Shrinkage data for greenheart (Ocotea rodiaei) and white oak (Quercus alba) are included for comparison. Recent tests of black kakeralli showed little or no warping, checking, or casehardening and consequently the wood was rated only moderately difficult to air dry. Exposed, unpainted wood, however, may show considerable checking (19).

Resistance to Decay and Marine Borers

The silica in manbarklak is reported to be a factor in its high resistance to marine borers. The wood is especially resistant in brackish water in places where Demerara greenheart (Ocotea rodiaei Mez.) has been severely damaged (12, 16). There is a record of 17 years of service in Surinam, and manbarklak has shown the best record of a large number of resistant species after 15 years of exposure to marine-borer attack in experiments conducted at Balboa, Canal Zone (3). Van Iterson and Söhngen (7) in an early paper report that manbarklak may be attacked by fungi and suggest that this may be prevented by keeping the wood either dry or under water to avoid deterioration. In a recent, unpublished report,[3] however, J. L. Bienfait, Director of the Forest Products Research Insitute T.N.O. in The Netherlands, states that manbarklak belongs in Durability Class 2. A footnote to the report explains that the woods in this class have been exposed in a temperate climate, without preservative treatment, for from 15 to 30 years in permanent contact with wet soil, or from 40 to 50 years to weather and wind, without serious damage by fungi.

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[3] Unpublished data in a communication dated March 26, 1953, from J. L. Bienfait, the Director of the Forest Products Research Institute T.N.O., Delft, The Netherlands.

Black kakeralli was rated very durable in resistance to both the representative brown-rot fungus (Poria monticola) and the white-rot fungus (Polyporus versicolor) (3).

Working Characteristics

Manbarklak is rated difficult to work and to glue. It splits readily. The wood can be finished, however, with a smooth, slate-like surface (3).

Pfeiffer (13) reports that manbarklak has an ash content of 2.24 percent with a large amount of siliceous material present. Tests of black kakeralli (E. sagotiana) made at the Institute of Paper Chemistry showed an ash content of only 0.63 percent. Spectrographic analysis, however, indicated that the ash was high in siliceous material (20).

Uses

Manbarklak is considered excellent for marine construction in sea water, even in the tropics (16). Its ability to withstand attack by marine borers has already been discussed in this report. It serves locally for the same purposes as the similar wood, black kakeralli; for example, for posts, crossties, and construction where durability is a requirement. The latter wood is considered suitable because of its strength properties and high wear or abrasion resistance, for ice sheathing for boats, factory flooring, shoe keels for landing boats, and pulp mill equipment, such as beaters and bed plates (3).

Structure

The pores are moderately small, solitary, or in small groups. Parenchyma is typically abundant, in numerous continuous bands one, two, or more cells in width. Strands of crystals are common. Inclusions of silica are reported in the parenchymatous tissues of manbarklak (1, 12).

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Table 1.--Mechanical properties of black kakeralli and the comparable woods, greenheart and white oak[1]

Property	Species[2]		
	Black Kakeralli: Eschweilera sagotiana	Greenheart: Ocotea rodiaei	White Oak: Quercus alba
Moisture content			
Green.....percent	50.7	42.7	68
Air-dry[3].....percent	14.2	14.8	12
Specific gravity			
Based on volume when green and weight when ovendry.....	0.82	0.88	0.60
Based on volume and weight when ovendry.....	0.98	1.06	0.71
Static bending			
Fiber stress at proportional limit			
Green.....p.s.i.	10,680	13,250	4,700
Air-dry[3].....p.s.i.	12,860	*16,200	8,200
Modulus of rupture			
Green.....p.s.i.	17,780	19,550	8,300
Air-dry[3].....p.s.i.	23,420	*25,500	15,200
Modulus of elasticity			
Green.....1,000 p.s.i.	2,910	2,970	2,250
Air-dry[3].....1,000 p.s.i.	3,250	*3,700	1,780
Work to proportional limit			
Green.....in.-lb. per cu. in.	2.28	3.31	1.08
Air-dry[3].....in.-lb. per cu. in.	2.84	*4.02	2.27
Work to maximum load			
Green.....in.-lb. per cu. in.	13.4	13.4	11.6
Air-dry[3].....in.-lb. per cu. in.	24.4	*22.0	14.8
Compression parallel to grain			
Fiber stress at proportional limit			
Green.....p.s.i.	6,170	7,580	3,090
Air-dry[3].....p.s.i.	*5,930	*10,000	4,760
Maximum crushing strength			
Green.....p.s.i.	7,780	10,160	3,560
Air-dry[3].....p.s.i.	11,210	*12,920	7,440
Modulus of elasticity			
Green.....1,000 p.s.i.	2,880	3,580	.....
Air-dry[3].....1,000 p.s.i.	3,750	*4,160	.....
Hardness[4]			
Green - end.....lb.	2,000	2,260	1,120
Green - side.....lb.	2,480	2,320	1,060
Air-dry[3] - end.....lb.	2,760	*2,140	1,520
Air-dry[3] - side.....lb.	2,780	*2,630	1,360

Table 1.--Mechanical properties of black kakeralli and the comparable woods, greenheart and white oak[1] (Continued)

Property	Species[2]		
	Black Kakeralli: Eschweilera sagotiana	Greenheart: Ocotea rodiaei	White Oak: Quercus alba
Compression perpendicular to grain			
Stress at proportional limit			
Green.....p.s.i.	1,580	2,040	830
Air-dry[3].....p.s.i.	*1,530	*1,970	1,320
Tension perpendicular to grain			
Green.....p.s.i.	560	1,070	770
Air-dry[3].....p.s.i.	860	*1,020	800
Shear			
Green.....p.s.i.	1,790	1,730	1,250
Air-dry[3].....p.s.i.	2,250	*1,830	2,000
Cleavage			
Green.....lb. per in. of width	390	610	420
Air-dry[3].....lb. per in. of width	*300	.....	450
Toughness[5].....in.-lb. per specimen	264.5	.....	[6]144.9

[1] This table shows results of tests on black kakeralli made by the Yale School of Forestry in cooperation with the Office of Naval Research and the Bureau of Ships, U. S. Navy Department. Average strength values for all the logs tested are presented (19). The results of tests on greenheart, cited in the same Yale report, were taken from Kynoch and Norton's publication (8). Values given for white oak and cited in the Yale report were taken from the U. S. Dept. of Agriculture Technical Bull. 479 (11).

[2] Source and number of logs: Black kakeralli -- British Guiana, 2 logs. Greenheart -- British Guiana. White Oak -- United States.

[3] Air-dry values adjusted to 12 percent moisture content except where designated (*), in which case the actual moisture content at time of testing (see Moisture Content in table) applies.

[4] The load in pounds required to embed a 0.444-inch steel ball to half its diameter.

[5] Toughness values are the average of tests of green and air-dry specimens 5/8 by 5/8 by 10 inches loaded on the tangential face over an 8-inch span.

[6] Value obtained for plank material received from the New York Naval Shipyard.

Table 2.--Shrinkage values for black kakeralli and comparable woods, greenheart and white oak[1]

Species and source	Shrinkage[2]			
	Radial	Tangential	Longitudinal	Volumetric
	Percent	Percent	Percent	Percent
Black Kakeralli (Eschweilera sagotiana) British Guiana	4.9	10.5	0.34	14.4
Greenheart (Ocotea rodiaei) British Guiana	8.2	9.0	.....	16.8
White Oak (Quercus alba) United States	5.3	9.0	.....	15.8

[1]This table shows results of tests on black kakeralli made by the Yale School of Forestry in cooperation with the Office of Naval Research and the Bureau of Ships, U. S. Navy Department. Average strength values for all the logs tested are presented (3). The results of the tests on greenheart, cited in the same Yale report, were taken from Kynoch and Norton's publication (8). Values given for white oak and cited in the Yale report were taken from the U. S. Dept. of Agriculture Technical Bull. 479 (11).

[2]Shrinkage values represent shrinkage from the green to the ovendry condition expressed as a percentage of the green dimension.

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